UF UNIVERSITY of FLORIDA | IFAS EXTENSION

Citrus Notes

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Inside this Issue:

Dear Growers,

Our first citrus grower meeting this fall will be held in Hillsborough County on September 1, 2010. In October the UF/IFAS County Citrus Extension Agents Fall Seminar Series will be held at our office in Bartow. Don't forget to mark your calendars for the Annual Citrus Employee Safety Training and Tractor Rodeo Program scheduled for November. Many growers across the county are now coordinating the psyllid control programs, if you are not participating now would be a great time to find out more about this effort. Drs. Tim Spann and Arnold Schumann just published an EDIS paper on mineral nutrition and pest and disease resistance. I reprinted the article in this issue for your review and consideration. By now you have heard about Temik and the impending cancellation of this product for Florida citrus, I have included the information from Bayer on the cancellation.

Enjoy the issue,

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September Citrus Roundtable

Our first Hillsborough County Citrus Roundtable of this season will be held at the Gulf Coast Research and Education Center in Balm. The Roundtable will be held on Wednesday, September 1, 2010 beginning at 10:00 a.m. and lasting about an hour.

Dr. Lukasz Stelinski, research entomologist, from the UF/IFAS Citrus Research and Education Center, will be our invited speaker. I asked Lukasz to bring us up to date on his current psyllid research program.

There will be one CEU for your Restricted Pesticide License (RUP) in one of the following categories: agricultural tree crop, private applicator or demonstration and research.

I'll be bringing the OJ, coffee and donuts for your enjoyment.

UF/IFAS Citrus Agents Fall Seminar Series

Your UF/IFAS County Citrus Extension Agents Fall Seminar Series will be held in various locations throughout the Florida citrus production region. I have enclosed an informational flyer about the seminar series. The program will be held in Bartow on Thursday, October 14, 2010, at the Stuart Conference Center. The program is free but, preregistration is required since lunch will be included.

2010 Hurricane Forecast Update

The Atlantic Basin remains on track for an active hurricane season, according to the scheduled seasonal outlook update issued today by **NOAA's Climate Prediction Center**, a division of the **National Weather Service**. With the season's peak just around the corner – late August through October – the need for preparedness plans is essential.

NOAA also announced today that, as predicted last spring, **La Niña** has formed in the tropical Pacific Ocean. This favors lower wind shear over the Atlantic Basin, allowing storm clouds to grow and organize. Other climate factors pointing to an active hurricane season are warmer-than-average water in the tropical Atlantic and Caribbean, and the tropical multi-decadal signal, which since 1995 has brought favorable ocean and atmospheric conditions in unison, leading to more active seasons.

"August heralds the start of the most active phase of the Atlantic hurricane season and with the meteorological factors in place, now is the time for everyone living in hurricane prone areas to be prepared," said Jane Lubchenco, Ph.D., under secretary of commerce for oceans and atmosphere and NOAA administrator.

Across the entire Atlantic Basin for the whole season – June 1st to November 30th – NOAA's updated outlook is projecting, with a 70 per-

cent probability, a total of (including Alex, Bonnie and Colin):

- 14 to 20 Named Storms (top winds of 39 mph or higher), including:
- 8 to 12 Hurricanes (top winds of 74 mph or higher), of which:
- 4 to 6 could be Major Hurricanes (Category 3, 4 or 5; winds of at least 111 mph)

These ranges are still indicative of an active season, compared to the average of 11 named storms, six hurricanes and two major hurricanes; however, the upper bounds of the ranges have been lowered from the **initial outlook** in late May, which reflected the possibility of even more early season activity.

"All indications are for considerable activity during the next several months," said Gerry Bell, Ph.D., lead seasonal hurricane forecaster at NOAA's Climate Prediction Center. "As we've seen in past years, storms can come on quickly during the peak months of the season. There remains a high likelihood that the season could be very active, with the potential of being one of the more active on record."

Annual Citrus Employee Safety Training and Tractor Rodeo

The annual Polk County Citrus Employee Safety Training and Tractor Rodeo program will be held on Tuesday, November 9, 2010. That morning we will begin with registration at 7:30 a.m. at the Stuart Conference Center, 1710 Highway 17 South, Bartow, FL. The first presentation will start at 8:00 a.m. Pre-registration is required and the cost will be $15 per person and that includes lunch. After lunch we will have the Tractor Rodeo competition. The registration form along with complete program details will be available in next months citrus newsletter.

International Research Conference on HLB

The 2nd International Research Conference on Huanglongbing "Reaching Beyond Boundaries" will be held in Orlando from January 10th to the 14th, 2011.

Conference registration will be open beginning September 1, 2010. For more information visit the following website: http://www.irchlb.org .

Wide Area Psyllid Sprays Continue in Polk County

Many growers in Polk and Hillsborough counties continue to coordinate this year's Asian citrus psyllid sprays. Early reports in these areas indicate the success of this effort in the overall reduction in psyllid populations. Remember that citrus greening transmission occurs through the feeding of citrus greening positive psyllids.

This coordination of application not only includes the timing of sprays but, also the selection of materials used for psyllid control. This coordination of materials will also help re-

duce the potential for the development of insecticidal resistance by the psyllid.

If you have additional questions or would be interested in participating in the regional effort, please contact me here at the office (863-519-8677). I can then pass on your contact information to the coordinators in these areas.

Mineral Nutrition Contributes to Plant Disease and Pest Resistance

Authors: Timothy M. Spann and Arnold W. Schumann Reprint of EDIS publication HS1181.

Mineral nutrients are essential for the growth and development of plants and microorganisms, and are important factors in plant-disease interactions. How each nutrient affects a plant's response to disease, whether positively or negatively, is unique to each plant-disease complex. This publication briefly summarizes plant mineral nutrition and what is known about how different nutrients affect different types of plant diseases (fungal, bacterial, viral, and soilborne) and pests.

In general, nutrient-pathogen interactions are not well understood. Plant nutrients may affect disease susceptibility through plant metabolic changes, thereby creating a more favorable environment for disease development. When a pathogen infects a plant, it alters the plant's physiology, particularly with regard to mineral nutrient uptake, assimilation, translocation, and utilization. Pathogens may immobilize nutrients in the soil or in infected tissues. They may also interfere with translocation or utilization of nutrients, inducing nutrient deficiencies or toxicities. Still other pathogens may themselves utilize nutrients, reducing their availability to the plant and thereby increasing the plant's susceptibility to infection. Soilborne pathogens commonly infect plant roots, reducing the plant's ability to take up water and nutrients. The resulting deficiencies may lead to secondary infections by other pathogens. Plant diseases can also infect the plant's vascular system and impair nutrient or water translocation. Such infections can cause root starvation, wilting, and plant decline or death, even though the pathogen itself may not be toxic.

Fertilizer Nutrients

In addition to carbon (C), hydrogen (H), and oxygen (O), which plants take up through the fixation of carbon dioxide (CO_2) via photosynthesis and water (H_2O) uptake via roots, there are 13 mineral nutrients that are *essential* for normal plant growth and development. These nutrients, their general relative abundance in plants, and their roles in plant biology are listed in Table 1. These nutrients are often viewed simply as plant food necessary for better plant growth and yield. However, mineral nutrition also influences growth and yield by affecting plant resistance or susceptibility to pathogens and pests.

Although disease resistance is genetically controlled, it is considerably influenced by environmental factors. Some disease resistance genes in plants are only activated by specific environmental stimuli. Mineral nutrition is an environmental factor that can be easily controlled in agricultural systems, the effects of which can be substantial.

In order to complement disease and pest control methods, it is helpful to know how mineral nutrients affect disease resistance in plants. Altering how plants respond to pest or disease attacks can increase resistance. There are two primary resistance mechanisms that mineral nutrition can affect:

1. The formation of mechanical barriers, primarily through the development of thicker cell walls.
2. The synthesis of natural defense compounds, such as phytoalexins, antioxidants, and flavanoids, that provide protection against pathogens.

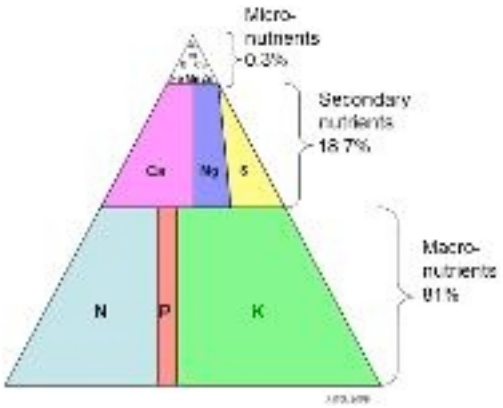

Figure 1. A schematic representation of the relative balance of macronutrients, secondary nutrients, and micronutrients for citrus. All of the nutrients are required and must be present in the proper ratios to build a balanced and complete pyramid. (Illustration: Arnold W. Schumann, UF/IFAS).

A balanced nutrient supply, illustrated for citrus in the form of a "nutrient pyramid" (Figure 1), ensures optimal plant growth and is usually considered optimal for disease resistance as well. As a rule, plants with an optimal nutritional status have the highest resistance (tolerance) to pests and diseases. Susceptibility increases as nutrient concentrations deviate from this optimum. The interaction between plants and disease organisms and pests is complex. However, the roles of mineral nutrients are well established in some areas of host-disease interaction. The goal is to recognize these interactions and see the possibilities and limitations of disease and pest control by mineral nutrition and fertilizer applications.

Fungal Diseases

Thinner, weaker cell walls leak nutrients from within the cell to the apoplast (the space between plant cells). This can create a fertile environment that stimulates the germination of fungal spores on leaf and root surfaces. Mineral nutrient levels directly influence the amount of leakage as well as the composition of what is leaked.

For instance, potassium (K) is essential for the synthesis of proteins, starch, and cellulose in plants. Cellulose is a primary component of cell walls, and K deficiency causes cell walls to become leaky, resulting in high sugar (starch precursor) and amino acid (protein building blocks) concentrations in the leaf apoplast. Calcium (Ca) and boron (B) deficiencies also cause a buildup of sugars and amino acids in both leaf and stem tissues. Nitrogen (N) is a key component of amino acids; therefore, an excessive supply of N can bring about higher amounts of amino acids and other N-containing compounds in plant tissues. These mineral imbalances lower resistance to fungal diseases by creating a more favorable environment for pathogens.

Most fungi invade the leaf surface by releasing enzymes, which dissolve the middle lamella (the "glue" that bonds adjacent cells). The activity of these enzymes is strongly inhibited by Ca, which further explains the close correlation between the Ca content of tissues and their resistance to fungal diseases.

As stated previously, plant tissues contain and produce a variety of defense compounds, which hinder fungal attacks. Boron plays a key role in the synthesis of these compounds. Borate-complexing compounds trigger the enhanced formation of a number of plant defense chemicals at the site of infection. The level of these substances and their fungistatic effect also decreases when the N supply is too high.

Mineral nutrition also affects the formation of mechanical barriers in plant tissue. As leaves age, the accumulation of silicon (Si) in the cell walls helps form a protective physical barrier to fungal penetration. Excessively high N levels lower the Si content and increase susceptibility to fungal diseases.

Other micronutrients play a role in disease resistance, too. Copper (Cu) is a plant nutrient that is widely used as a fungicide. The amount required, however, is very much higher than the nutritional requirement. The action of Cu as a fungicide relies on direct application to the plant surface and the infecting fungi. From a nutritional perspective, Cu deficiency leads to impaired defense compound production, accumulation of soluble carbohydrates, and reduced lignification (wood development), all of which contribute to lower disease resistance.

Bacterial Diseases

Mineral nutrition affects susceptibility to bacterial infections in much the same way that it affects fungal infections. Potassium and Ca play key roles in forming an effective barrier to infections. When K, Ca, and, often, N levels are deficient, plants are more susceptible to bacterial attacks. A frequent symptom of B deficiency is the development of "corky" tissue along leaf veins and stems as a result of the irregular (misshapen) cell growth that occurs when B is deficient. These irregular cells are more loosely bound than normal cells, essentially producing wounds through which bacteria can enter.

Adequate N levels increase plant resistance to most bacterial diseases; however, excessive N can have the opposite effect. As a rule, parasites that live on senescing (dying) tissue or that release toxins in order to damage or kill the host plants thrive in low N situations. However, some bacteria actually increase under high N conditions. These bacteria usually depend on food sources from living tissue.

Disease relationships to K content are more consistent. A review of 534 research articles found that K reduced bacterial and fungal diseases 70% of the time and insects and mites 60% of the time. Unlike for other nutrients, the generalization can be made for K that *an adequate supply usually results in an increased resistance to attack by all parasites and pests*. Potassium deficiencies created by overapplication of dolomite or magnesium lower this resistance.

Ca affects the incidence of bacterial disease in a variety of ways. First, Ca compounds play an essential role in the formation of healthy, stable cell walls. Adequate Ca also inhibits the formation of enzymes produced by fungi and bacteria, which dissolve the middle lamella, allowing penetration and infection. Ca deficiencies trigger the accumulation of sugars and amino acids in the apoplast, which lowers disease resistance. Fruit tissue that is low in Ca is also less resistant to bacterial diseases and physiological disorders that cause rotting during storage.

In general, similar principles govern the effect of both micronutrients and macronutrients on disease resistance: *Any* nutritional deficiency hinders plant metabolism and results in a weakened plant, which lowers disease resistance.

For instance, the lack of one small ounce of molybdenum (Mo) per acre can lower disease resistance by impeding the production of nitrate reductase. This is an enzyme that contains two molecules of Mo, and it is required to convert nitrates to proteins. This example also illustrates the importance of *balanced* nutrition—no nutrient functions in isolation from the others. *All* essential nutrients are

critical for the proper metabolic functioning of higher plants.

Viral Diseases

Nutritional factors that favor the growth of host plants also favor virus multiplication. This holds true particularly for N and phosphorus (P). However, despite the rapid multiplication of the virus, visible symptoms of the infection do not necessarily correspond to an increase in mineral nutrient supply to the host plant. In fact, symptoms of virus infections sometimes disappear when N supplies are large, even though the entire plant is infected. Visible symptoms are dependent upon the competition for N between the virus and the host cells. This competition varies with different diseases and can be influenced by environmental factors, such as temperature.

Soilborne Fungal and Bacterial Diseases

Mineral nutrition affects soilborne diseases in many different ways. A micronutrient-deficient plant usually has depressed defense capabilities against soilborne diseases. However, in some cases, nutrients can have direct effects on soilborne pathogens. For example, soil-applied manganese (Mn) can inhibit the growth of certain fungi. Also, nitrites are toxic to some *Fusarium* and *Phytophthora* species. Nitrites are formed from ammonium nitrogen in the nitrogen cycle as it is converted to nitrates by beneficial soil bacteria. This two-step process is shown in Figure 2.

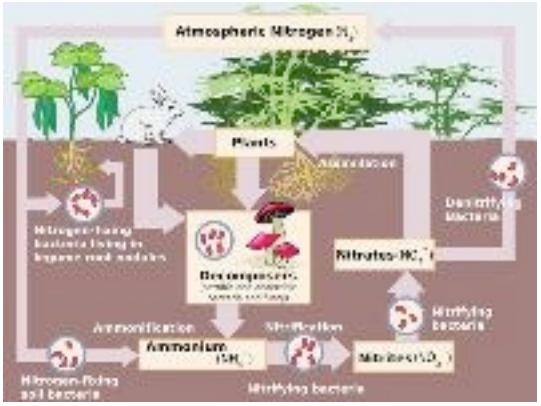

Figure 2. A schematic representation of the nitrogen cycle. Ammoniacal nitrogen enters the system through the fixation of atmospheric nitrogen by bacteria, the decomposition of organic matter by bacteria and fungi, or through fertilizer application. Ammonium is oxidized to nitrite and then nitrate by bacteria through a process known as nitrification. Plants take up (assimilate) nitrogen as either ammonium or nitrate. (Illustration from Wikimedia Commons, http://commons.wikimedia.org/).

The use of ammonium-based fertilizers can increase the incidence of some diseases (e.g., *Fusarium* and *Phytophthora* root rots), whereas nitrate-based fertilizers generally have the opposite effect. One explanation for this effect is how these different N forms affect soil pH. Ammonium fertilizers generally decrease soil pH over time, particularly in soils with low buffering capacity, and nitrate fertilizers tend to either slightly increase soil pH or have no effect. However, some studies have found that the effects these two N fertilizer forms have on soilborne diseases are independent of soil pH, further indicating the complex relationship of mineral nutrition and disease.

Pests

Pests are organisms such as insects, mites, and nematodes that are harmful to cultivated plants. In contrast to fungal and bacterial pathogens, visual factors such as leaf color

are important factors in pest susceptibility. Nutritional deficiencies discolor leaf surfaces and increase susceptibility to pests. The Asian citrus psyllid, *Diaphorina citri*, for example, tends to settle on yellow reflecting surfaces (i.e., surfaces that appear yellow in color to the human eye).

Three primary pest defenses of plants are:

1. Physical surface properties: color, surface properties, hairs
2. Mechanical barriers: tough fibers, silicon crystals, lignification
3. Chemical/biochemical: content of attractants, toxins, repellents

Mineral nutrition affects all three defense systems. Generally, young or rapidly growing plants are more likely to suffer attack by pests than older, slower-growing plants. Therefore, there is often a correlation between N applications (stimulation of growth) and pest attack. Boron deficiency reduces the resistance to pest attack in the same ways it reduces resistance to fungal infections. It is used in the synthesis of flavanoids and phenolic compounds, which are a part of the plant's biochemical defense system.

Summary

In the game of baseball, no home runs are scored without touching first base. In the strategies of integrated pest management, mineral nutrition is first base. Optimizing mineral nutrient levels—especially at critical stages when pest populations are threatening—is both cost effective and agronomically sensible.

Acknowledgments

The authors wish to thank Mr. Timmy Mann for his significant contributions to and critical review of this document.

Table 1. The 13 essential mineral nutrients required by all plants for normal growth and development.

Nutrient	Chemical symbol	Relative abundance (%)	Function in plant
Nitrogen	N	100	Proteins, amino acids
Potassium	K	25	Catalyst, ion transport
Calcium	Ca	12.5	Cell wall component
Magnesium	Mg	8	Part of chlorophyll
Phosphorus	P	6	Nucleic acids, ATP
Sulfur	S	3	Amino acids
Chlorine	Cl	0.3	Photosynthesis reactions
Iron	Fe	0.2	Chlorophyll synthesis
Boron	B	0.2	Cell wall component
Manganese	Mn	0.1	Activates enzymes
Copper	Cu	0.01	Component of enzymes
Zinc	Zn	0.03	Activates enzymes
Molybdenum	Mo	0.0001	Involved in N fixation

Pesticide News and Information

Temik® Cancellation Notice

On August 16, 2010, Bayer CropScience provided the following attached information on the cancellation of Temik® for use on Florida citrus.

Imidan® Insecticide

On June 4th, the FDACS accepted the amended SLN FL-010006 (Imidan® use in grapefruit and orange for control of scale, mealybug, and weevil). The amended label contains the restricted entry interval (3 days) as well as the setbacks for ground (25 feet) and aerial (50 feet) application. (FDACS letter, 6/4/10).

Intrepid® Application Volumes

On July 4th, the FDACS accepted the amended SLN FL-100001 (Intrepid® use in citrus for lepidoptera). The amended label contains the minimum application volume (20 GPA). (FDACS letter, 7/1/10).

Importance of Resistance Management

After two years of suspension of spinosyn insecticides in eastern Palm Beach and Broward counties, the suspension has expired as of July 1, 2010. The use restriction was put in place to prevent further development and spread of western flower thrips (WFT) resistance to these spinosyn insecticide products and to restore WFT susceptibility to the spinosyns in these counties. There is now much greater awareness and adoption of IPM and resistance management practices for WFT by growers, thanks to the communication efforts of UF Extension and Dow AgroSciences. Monitoring of WFT in the affected area during the last 2 years has shown a shift toward greater spinosyn susceptibility. Growers are also making use of a broader range of insecticides that encompass a wider range of modes-of-action to manage WFT, and new products with significant WFT activity will be registered soon. The relevant products are Entrust® (spinosad), Conserve® SC (spinosad), Spintor® 2SC (spinosad), Delegate® WG (spinetoram), and Radiant® SC (spinetoram). However, some growers have found that sometimes no sprays allow the beneficial insects to manage WFT. (UF Extension email, 7/1/10).

Fyfanon® Insecticide

On July 12th, the FDACS accepted the special local need (SLN) registration SLN FL-100004 [Fyfanon® ULV AG (malathion) use in citrus for control of Caribbean fruit fly]. The SLN label is identical to the SLN FL-040004 (which will be canceled) except for the EPA product registration number which is now 67760-35 rather than 67760-34. This change was issued at the request of Cheminova to reflect the "splitting-off" of the agricultural uses from the original label. (FDACS PREC Agenda, 8/5/10).

Citrus Greening Found on St. Croix

The USDA Animal and Plant Health Inspection Service recently confirmed the presence of citrus greening on key limes on the Island of St. Croix. The bacterial disease was confirmed on an agricultural research station and nearby residences. (*Citrus & Vegetable Magazine*, June-July, 2010).

Medfly Update

An entomologist at FDACS Division of Plant Industries recently stated that three weeks have passed without any wild Medfly finds (one life-cycle is 21 days). The last find was in the Boca Raton core on July 3rd. The second lifecycle will be completed on August 11th and the third and final lifecycle on September 1st. If trapping remains negative a declaration of eradication will be sought. Until then, detection activities remain on a weekly basis and aerial release of sterile flies will continue TBD. (UF Extension email, 8/4/10).

Citrus Management Strategies
in a new Disease Era

A Citrus Extension Agent Fall Mini-Series Program
http://citrusagents.ifas.ufl.edu

Program Agenda

8:30 am	Registration
9:00 am	Citrus Black Spot Management Update
9:40 am	Asian Citrus Psyllid Management
10:20 am	Break
10:40 am	Growing a Young Citrus Tree in the Greening Era
11:20 am	Foliar Feeding and SAR for Citrus Trees
12:00 pm	Sponsored Lunch

Continuing Education Units (CEUs) will be offered for Certified Pesticide Applicators and Certified Crop Advisors.

Speakers

Steve Futch, Tim Gaver, Tim Hurner, Chris Oswalt, Mongi Zekri, Gary England, Ryan Atwood

Meeting Dates and Location

September 29th	Lake County Extension Service Office	1951 Woodlea Road, Tavares
September 30th	Bert J. Harris Agricultural Center	4509 George Blvd., Sebring
October 5th	Indian River Research and Education Center	2199 South Rock Road, Ft. Pierce
October 7th	Southwest Florida Research and Education Center	2685 SR 29 North, Immokalee
October 12th	Turner Agri-Civic Center Exhibition Hall	2250 NE Roan Street, Arcadia
October 14th	Polk County Stuart Conference Center	1710 Hwy 17 South, Bartow

For more information, please contact the local multi-county citrus extension agents.

To register for a specific location, please contact:

Tavares	Lake County Extension Service	352-343-4101
Sebring	Highlands County Extension Service	863-402-6540
Ft. Pierce	St. Lucie County Extension Service	772-462-1660
Immokalee	Hendry County Extension Service	863-674-4092
Arcadia	Desoto County Extension Service	863-993-4846
Bartow	Polk County Extension Service	863-519-8677

Pre-registration is required.

UF UNIVERSITY of FLORIDA
IFAS Extension

Bayer CropScience

FOR IMMEDIATE RELEASE

Bayer CropScience Cooperates with EPA's Decision to Cancel Temik® Uses in Citrus and Potatoes

Press Release

August 16, 2010

Bayer CropScience
2 T.W. Alexander Drive
Research Triangle Park
NC 27709
Tel. 919-549-2000

RESEARCH TRIANGLE PARK, N.C. (August 16, 2010) — Bayer CropScience is cooperating with the Environmental Protection Agency (EPA) following today's announcement to cancel uses of aldicarb, sold as Temik® brand insecticide/nematicide, on potatoes and citrus. Uses on all other crops will remain, but will be phased out over the next few years.

According to the agreement with the EPA, farmers may continue to use existing stocks of Temik on citrus and potatoes until December 31, 2011, allowing inventories to clear the channel of trade. Uses on all other crops will be maintained with some additional label changes, until an orderly product phase-out is completed, consistent with Bayer's global replacement strategy regarding WHO Class 1 products. The company plans to discontinue marketing aldicarb in the United States and other markets worldwide by 2014.

This decision follows a new dietary risk assessment process recently completed by the Agency. Although the company does not fully agree with this new risk assessment approach, Bayer CropScience respects the oversight authority of the EPA and is cooperating with them. This decision does not mean that aldicarb poses a food safety concern.

"For nearly 40 years, Temik has provided farmers with unsurpassed control of destructive pests, without compromising human health or environmental safety" said Bill Buckner, President and CEO of Bayer CropScience. "We recognize the significant impact this decision will have on growers and the food industry, and will do everything possible to address their concerns during this transition".

The company will work with farmers and other stakeholders in the distribution chain during this phase-out process. Customers can contact the Bayer CropScience Customer Interaction Center at 866-992-2937 for further information.

(more)

“Bayer CropScience is committed to bringing new innovation solutions from seed to harvest to growers to ensure we continue to have a safe, abundant and affordable food supply,” said Buckner. “We recognize the loss of this tool to growers, and we have and will continue to seek innovative solutions to fill this void.”

For more information contact:
Jack Boyne
Bayer CropScience
Tel. (919) 549-2231

About Bayer CropScience

Bayer is a global enterprise with core competencies in the fields of health care, nutrition and high-tech materials. Bayer CropScience AG, a subsidiary of Bayer AG with annual sales of about EUR 6.5 billion (2009), is one of the world’s leading innovative crop science companies in the areas of crop protection, non-agricultural pest control, seeds and traits. The company offers an outstanding range of products and extensive service backup for modern, sustainable agriculture and for non-agricultural applications. Bayer CropScience has a global workforce of 18,700 and is represented in more than 120 countries. This and further news is available at: www.press.bayercropscience.com.

Forward-looking statement

This news release may contain forward-looking statements based on current assumptions and forecasts made by Bayer Group or subgroup management. Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in Bayer’s public reports, which are available on the Bayer website at www.bayer.com. The company assumes no liability whatsoever to update these forward-looking statements or to conform them to future events or developments.